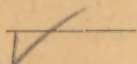


Baker (A. R.)

MYOPIA.*



BY ALBERT R. BAKER, M. D., CLEVELAND, O.

Prof. of Ophthalmology, Otology and Laryngology in the Medical Department of Wooster University.



There is no subject which demands the same careful consideration of the thoughtful physician or student of sociology as that of myopia. It is a disease peculiar to civilization, and one that is rapidly on the increase. It is somewhat doubtful whether the ancients ever suffered from myopia. Probably the earliest myope of whom we have any record was the Emperor Nero, who used a concave glass so that he was enabled better to see the gladiatorial contests.

Observations have proven that all animals are hypermetropic and that myopia is peculiar to man, and as Landott has well said, the *disposition* to myopia is therefore found in the development of the human race, and the *determining cause* in what is more particularly called civilization.

The rapid and uniform increase of myopia in school children is remarkable. In the primary grades of many of our city schools not more than two or three per cent. of myopia will be found. In the grammar grades from ten to fifteen per cent. will be met. In the high schools from twenty to thirty per cent., while in many of our colleges the percentage of myopia will be increased to forty or even seventy per cent. The influence in producing

* Read before the Mississippi Valley Medical Association, Louisville, Kentucky, October 9, 1890.

1889-90 V, 525-535

myopia, as the result of the close application which is demanded of the eyes in school work, is best seen by comparing it with the following table of examinations of soldiers in France by Tscherning.—Arch. F. Opth., xxix., p. 201, 1883.

	TOTAL.	MYOPES.	PER CENT.
Day Laborers, Peasants and			
Sailors, - - -	2326	57	2.45
Mechanics of various kinds,	2861	150	5.24
Mechanics engaged with			
near work, - - -	566	66	11.66
Artists, Engineers and Ar-			
chitects, - - -	270	36	13.33
Merchants, - - -	1009	159	15.76
Professional Men, - -	491	159	32.38

We are greatly indebted to Von Graefe and Donders for our knowledge of the pathology of myopia. It was held for many years that myopia was due to an increased convexity of the cornea or of the lense, or both, or else due to opacities or changes in the vitreous, but it has been fully settled that myopia, practically speaking, in all cases is due to an elongation of the eye-ball at its posterior pole and is due to a great variety of causes, heredity playing an important role in its production. It is probable that the myopia itself is not hereditary, but the dyo-cephalic form of head and face is markedly so, and thus predisposes the individual to myopia.

The *exciting* causes are found in reading and using the eyes on small objects near the eye, bad light and holding the book too close to the eye, stooping posture in schools, improper arrangement of seats, bad typography, opacities of the cornea or media, astigmatism.

But these alone are not sufficient to account for the production of myopia, and we must seek for some condition of the eye itself, which may be found in a weakened condition of the *coats* of the eye, so that they are not enabled to withstand the intra-ocular pressure. A reference to the anatomical condition will show that the part of the eye least able to resist this pressure is the posterior part

of the eye-ball. It is already weakened by the entrance of the optic nerve, and it does not have the support of the muscles and lids which the anterior portion and sides have.

The myope not being able to see objects beyond his range of accommodation, closes the lids tightly over the ball, leaving only a small slit so as to get stenopaic vision, and thus the injurious pressure continues when he looks at a distance as well as near by.

But we must still seek farther than to a merely weakened condition of the coats of the eye and increased pressure, to arrive at a clear understanding of the cause of myopia. There is in these cases a choroiditis which I believe is the important pathological condition in the production of the posterior staphyloma and resulting myopia. And this is always to be found in the early history of the disease. Although the sclerotic is the principal envelope (the skeleton) that gives support to the eye-ball, it can easily be understood that an inflammation of the choroid may also involve the sclerotic. Why this inflammation should in these cases always involve the posterior part of the eye-ball may be explained by the fact that this is the part that is always subjected to brightest light and where almost all the labor of seeing is performed, and consequently subject to the greatest irritation. It performs the most physiological labor and consequently is the first to suffer when abused.

Among our school children will always be found a number who are said to have "naturally weak sight." Their eyes are subject to irritation, black spots are complained of, photophobia and pain, together with various other subjective symptoms of inflammation.

An ophthalmoscopic examination reveals a hyperemic disk, a slight blurring of its outlines, a condition of the fundus which has been described as the "peach blow" choroiditis. After a time there is a deposit of pigment around the disk, which is followed by staphyloma, atrophy, hemorrhage, detachment of the retina, cataract, opacities

of the vitreous and all the serious consequences of malignant myopia. It is altogether probable that the posterior staphyloma is a conservative factor which, by the relief of injurious pressure, prevents other more serious troubles. Dr. Risley has attempted to demonstrate (and his views have coincided with that of many observers) that cataract is a disease of old age, not because of the age, but because the sclerotic has greater resisting power, and that when a choroiditis is developed in an old person, injurious disturbances of nutrition are caused, resulting in cataract, while in younger persons, the sclerotic yields, the proper nutrition of the eye is preserved, the lense remains clear, and myopia is thus developed.

It can not be objected to this view of the etiology of myopia that intra-ocular tension is not increased in myopia, because the yielding of the sclerotic in the posterior pole is the element that prevents the increase of tension. In glaucoma we have an increase of tension, but the circumstances are entirely different. It occurs usually in hypemetropic eyes and at an advanced age, and the excavation when it occurs in glaucoma is confined to the papilla, because it is the weakest point. It is possible that not a remote connection between choroiditis, posterior staphyloma, cataract and glaucomatous excavation of the disk may yet be established, all depending on one cause, or the same combination of causes. Other causes which have an influence in the production of myopia are compressions of the globe by the extrinsic muscles of the eyeball. Von Arlt's theory that the softening of the sclerotic at the posterior pole is due to a venus stasis caused by the compression of the venæ vorticosæ by the oblique muscles in convergence, is a plausible one. An arrested development of the sclerotic has also figured in ophthalmological literature as a cause of myopia. There is no doubt but that all these may have an influence in the production of myopia, but a careful weighing of all the evidence and close clinical observation of progressive cases of myopia will convince the most skeptical that the process is essen-

tially an inflammatory one, which will be found to vary from a simple hyperemia to an intense disseminated choroiditis. Only a small portion of the fundus may be involved, or the entire membrane even extending so as to include the retina, sclerotic and other ocular structures.

Subjective symptoms of myopia are those of indistinct vision at a distance and the discord that exists between conveyance and accommodation, which I have discussed in another paper.*

But even in low degrees of myopia the patient often suffers from hyperemia of the fundus oculi, which gives rise to all sorts of visual trouble. He suffers from asthenopia, muscæ volitantes, fatigue of the eyes, pain in the orbit, a sense of fullness and pressure in the head, or even headaches. The pain often becomes more severe and is neuralgic in character.

The dark patches dancing before the eyes are especially annoying to the myope, because he sees them plainer, and owing to the sensitiveness of the retina they cause him more annoyance than others. He never tires of describing these apparitions which assume all sorts of fantastic shapes, and the more he pays heed to them the more he can see them. Owing to his being shut out from most of the pleasures of sight which his defective vision denies him, he is more introspective and to a certain extent often becomes a monomaniac on the subject of these visual apparitions. As the disease progresses there are added to these physiological corpuscles which are present in the eye of every person and can be seen by anyone looking at a white surface, such as a white wall or the clear sky, pathological exudations into the vitreous, which are more troublesome to the patient, often interfering greatly with vision. As the exudations take place into the choroid and beneath the retina, distortion of objects are complained of, especially horizontal and perpendicular lines. The patient, as Landolt has said, is often placed in a "vicious circle of action and re-action, for the more

* Nervous diseases of reflex origin.—Journal of the Am. Med. Ass'n.

he pursues these phantoms the more he is harrassed by them, nothing being more fatiguing than the observation of such entopic phenomena."

But this is only the beginning of a long series of accidents that may befall him. Little by little he may find his vision failing him, or suddenly he may discover a large *scotoma*, due to hemorrhages in portions of the retina. If the fovea centralis be involved, all central vision is lost. These hemorrhages are absorbed very slowly and they are very liable to recur. When absorption takes place they almost always leave a patch of atrophy, and vision from this part can never hope to be restored.

Detachment of the *retina* is another accident even more serious, to which highly myopic eyes are especially predisposed. *The liquefaction* of the *vitreous*, which occurs sooner or later in cases of choroiditis, is a factor that adds greatly to the dangers of detachment. And these are not all the dangers, for not infrequently *cataract* is developed, which is slow to mature, and when ripe difficult to remove on account of the atrophy which has taken place of its suspensory ligament and the fluid vitreous behind it, and when removed, the condition of the eye is often such as to be of but little service. And even though he escape all the dangers of myopia, he may have started a chronic inflammatory process in his eyes, resulting in glaucoma in later life.

The diagnosis of myopia is not difficult in most cases, although in cases of spasm of the accommodation, we may have emetropia or even hypermetropia simulating myopia. It is not unusual to find hypermetropic patients wearing concave lenses fitted by some optician who advertises to fit spectacles *scientifically*, free of charge. In all cases of error of refraction, when there is a marked difference in the results obtained by the ophthalmoscope and the tests made by the test types and lenses, atropia should be used. Myopic patients suffer the least inconvenience from the use of atropia, as their accommodation plays a small part in the visual efforts.

But to differentiate a stationary myopia from a progressive one is difficult, especially in the lower degrees, and will require the most careful examination on the part of the physician.

If the myopia be less than 2 D, and the patient past twenty-five, and there are no annoying subjective symptoms of any kind, and vision can be improved to $\frac{20}{20}$, and has apparently remained stationary for some time, there is a probability that this patient will go through life without any serious annoyance other than being obliged to resort to the use of spectacles, for distant vision. The only compensation that may be offered is that the use of presbyopic glasses may be postponed for a few years, but the patient will be obliged to resort to two pair; one for reading and one for distance, in later life. There is no truth in the popular fallacy that near-sighted eyes are strong eyes. I cannot refrain from calling your attention in this connection to M. Sarcey's little work entitled "Mind your eyes. Good advice from a near-sighted man to his fellow-sufferers."

With the changes which take place in the choroid retina, optic nerves, pupils and sclera, there are certain changes which can be seen by the ophthalmoscope, and reveals to the examiner the exact condition and enables him to say whether there has been serious damage done, and whether it is temporary or not, and he will be able to state with considerable accuracy what the prognosis will be. In the lower forms myopia of 2 D or less, there may be no ophthalmoscopic signs visible except the error of refraction. If, however, the disease is progressive, there will be a hyperemia of the fundus or blurring of the optic disk, in short, a sub-acute choroiditis. The appearance has been described as the "peach blow fundus." But, if the case has proceeded a little farther, there will be a crescent-shaped figure added to the papilla, at the outer side.

If it has progressed somewhat farther there will be a larger posterior staphyloma which may include the entire disk.

The appearance can readily be understood if we remember that the three coats of the eye are intimately connected, and that when the sclerotic becomes elongated, stretched, the choroid and retina must necessarily undergo a similar stretching process, and will become thinned and allow the white sclerotic to become visible through it. But this is not the only ophthalmoscopic appearance which may be present as the stretching of the coats of the eye progresses. There may be a rupture of one or more blood-vessels and hemorrhage into the substance of the choroid, retina, or into the vitreous, or between the retina and choroid, causing a detachment of the retina. If seen early the hemorrhage will appear as a bright red clot of blood. If later it will present a darker, almost black appearance. As it becomes absorbed there will be more or less atrophy of the choroid and retina and the position of the clot will always be recognized by a white atrophic patch. The clot of blood during the period of absorption will be surrounded by a hazy zone, indicating a local choroiditis. These clots will vary greatly in size, from that of a pin-point, almost invisible, to that of many times the size of the disk. There also may be seen other evidence of choroiditis, such as deposits of pigment, stretching of blood-vessels, exudations into the vitreous, irridocyclitis and cataract.

Prophylatic Treatment. Much can be accomplished by improved hygienic surroundings, good food, plenty of outdoor exercise, long hours of sleep, good light, large type, good uncallendered paper, sitting erect, holding books and all work at as long a distance from the eyes as possible for distinct vision. This implies shorter school hours, less reading of illy printed newspapers and trashy novels, less practice on the piano, more base ball, running, hunting, fishing, walking, riding, driving. In fact, a change in our entire educational system as now conducted. Whether this is practicable or even desirable must be left to political economists to determine. While the picture presented of all the evil consequences of myopia is not

overdrawn, the writer does not believe that there is any immediate danger of the race all becoming myopic. While statistics prove that there is a rapid progression of from two or three to sixty or seventy per cent. of myopia from the primary school through the grammar and high schools to the colleges, it is not probable that if all pupils who entered the primary schools continued their studies until they graduated from the colleges that the percentage of myopes would be so large. The myopic child is shut out from much of the pleasure of out-door life that the emetrope enjoys. His field of vision is contracted. He may hear the birds sing, but he does not see their bright plumage except as they are confined to the aviary. He may enjoy the fragrant odors of green fields and forests, but his vision is limited to a few feet in circumference. He may be endowed with the strength of Hercules, but his defective vision prevents him from enjoying the boisterous exercises of the play-ground. Consequently he derives his pleasure from reading and such pastimes as he can enjoy with a limited range of vision. He thus naturally takes greater pleasure in books, and by a process of natural selection he continues to pursue his studies, while his more fortunate (some would say less fortunate) class-mate, with normal vision, drops out by the way and enters some pursuit in life more congenial.

It is necessary to give myopic children spectacles so that they may be able to gain an adequate idea of the beauties of nature and art which surround them. It also enables them to sit erect and prevents the stooping posture which causes the congestion of the head and eyes, which is one of the causes of the increase of the myopia. It also, by placing objects at a greater distance, prevents the excessive effort for convergence and removes another fruitful cause of the increase of the myopia. In these cases the *weakest* glass with which vision can be brought up to the normal should be ordered.

If the myopia is progressive, children should be taken out of school for a time, atropia used to paralyse all

accommodative efforts and the general health carefully attended, out-door sports encouraged and all efforts at vision for small objects interdicted. If necessary, a broad shade or tinted glasses may be ordered. It is a question in the minds of many oculists whether the error of refraction should be corrected with spectacles. In my opinion it should be, as the improvement in the vision will more than counterbalance the injury, if any, due to increased accommodative efforts.

At the end of some months, or a year, it may be permissible, if the myopia ceases to be progressive, to permit the studies to be resumed, but it should be done guardedly and close watch kept of the eyes for a relapse of the malignant trouble.

Considerable judgment and experience is necessary in ordering spectacles for these cases. The following remarks are suggestive, and cannot be followed implicitly.

In low degrees of myopia, 1 D, or less, it is usually best to correct the myopia fully, and the same glasses may be worn for reading and distance or for distance only, and none for reading. The comfort of the patient should be consulted, especially in adults, as to wearing of them for reading. If worn for distance only, eye-glasses may be given if preferred by the patient.

In moderate degrees of from 2 to 5 D it is usually advisable to wear spectacles both for reading and distance. If the same glass can be worn with comfort for both near and distant vision, it is preferable to do so, as it avoids the necessity of using two pair of spectacles. In many myopes of this class, especially if the use of glasses has not been commenced until after adult life, the increased accommodative efforts required to see distinctly near objects causes fatigue, and may necessitate the use of a weaker pair for reading. In higher degrees of myopia of from 5 to 9 D, two pair of lenses will usually be required, one correcting the error of refraction fully and another of lower power for reading. In high degrees of myopia of 9 D or over, it will be seldom practicable to correct the

refraction fully, and the patient must be content to see less perfectly at a distance. It is usually advisable to determine the amount of error accurately and then deduct about 4 D from this amount. Many patients will wear this glass with comfort for both near and distant work, although some will require a weaker lense for reading.

If there should be a difference of more than 1 D in the refractive error of the two eyes, it is not advisable to correct both, but correct the weaker of the two, and give a similar lense for the other eye. If binocular vision has never been established, owing to a great difference in refraction of the eyes, one eye being used for distance and the other for near vision, an exception to this rule may be made, and each eye corrected independently of the other.

If any astigmatism be presented in either eye, it should be corrected fully.

